

What is claimed is:

1. A control apparatus controlling a zoom lens including, in order from an object side, a first lens unit which moves for varying the magnification, a light amount adjusting unit which adjusts a light amount, and a second lens unit which moves for focusing, the zoom lens being mountable on a camera, the control apparatus comprising:

a memory which stores in-focus position data of the second lens unit with respect to a position of the first lens unit; and

a controller which controls a position of the second lens unit with respect to a position of the first lens unit based on the in-focus position data,

wherein the controller sets a reference position of the second lens unit for position control of the second lens unit with the in-focus position data based on an in-focus position of the second lens unit for an object at anywhere from a minimum object distance to an infinite distance when the first lens unit is located at a wide-angle end.

2. The control apparatus according to claim 1, wherein the in-focus position data is zoom tracking data which represents a moving track of the second lens unit for realizing the same image-forming position at the same object distance regardless of movement of the first lens unit,

the memory stores a plurality of the zoom tracking data for object distances, and

the controller sets the reference position as a base point of one of the plurality of zoom tracking data based on the in-focus position of the second lens unit.

3. The control apparatus according to claim 1, wherein the controller performs setting operation of the reference position when power supply thereto is started from the camera or from the outside.

4. The control apparatus according to claim 1, wherein the controller detects the presence or absence of a change in the reference position while images are taken, and when any change is detected, the controller performs new setting operation of the reference position.

5. A control apparatus controlling a zoom lens including, in order from an object side, a first lens unit which moves for varying the magnification, a light amount adjusting unit which adjusts a light amount, and a second lens unit which moves for focusing, the zoom lens being mountable on a camera, the control apparatus comprising:

a memory which stores in-focus position data of the second lens unit with respect to a position of the first lens unit; and

a controller which controls a position of the second lens unit with respect to a position of the first lens unit based on the in-focus position data,

wherein the controller sets a reference position of the

second lens unit for position control of the second lens unit with the in-focus position data based on a difference between an in-focus position of the second lens unit for an object at anywhere from a minimum object distance to an infinite distance when the first lens unit is located at a wide-angle end and an in-focus position of the second lens unit for the object when the first lens unit is located at a predetermined focal length position other than the wide-angle end.

6. The control apparatus according to claim 5, wherein the zoom lens satisfies the following condition:

$$2\epsilon F/|s| \leq |M_w|$$

where  $\epsilon$  represents a permissible circle of confusion of the camera,  $F$  represents a full  $F$  number when the first lens unit is located at a wide-angle end,  $s$  represents sensitivity of the second lens unit to a back focal distance, and  $M_w$  represents a difference between in-focus positions of the second lens unit for an object at the infinite distance and for an object at the minimum distance, when the first lens unit is located at the wide-angle end.

7. The control apparatus according to claim 5, wherein the memory stores data for determining the reference position based on the difference between the in-focus positions in accordance with a distance to the object, and the controller sets the reference position with the data.

8. The control apparatus according to claim 5, wherein the in-

focus position data is zoom tracking data which represents a moving track of the second lens unit for realizing the same image-forming position at the same object distance regardless of movement of the first lens unit,

the memory stores a plurality of the zoom tracking data for object distances, and

the controller sets the reference position as a base point of one of the plurality of zoom tracking data based on the difference in the in-focus positions of the second lens unit.

9. The control apparatus according to claim 5, wherein the controller performs setting operation of the reference position when power supply thereto is started from the camera or from the outside.

10. The control apparatus according to claim 5, wherein the controller detects the presence or absence of a change in the reference position while images are taken, and when any change is detected, the controller performs new setting operation of the reference position.

11. A control apparatus controlling a zoom lens including, in order from an object side, a first lens unit which moves for varying the magnification, a light amount adjusting unit which adjusts a light amount, and a second lens unit which moves for focusing, the zoom lens being mountable on a camera, the control apparatus comprising:

a memory which stores in-focus position data of the second lens unit with respect to a position of the first lens unit; and

a controller which controls a position of the second lens unit with respect to a position of the first lens unit based on the in-focus position data,

wherein the controller sets a reference position of the second lens unit for position control of the second lens unit with the in-focus position data based on a difference between in-focus positions of the second lens unit for an object at anywhere from a minimum object distance to an infinite distance when the first lens unit is located at least two predetermined focal length positions.

12. The control apparatus according to claim 11, wherein the zoom lens satisfies the following condition:

$$2\varepsilon F/|s| \leq |M_w|$$

where  $\varepsilon$  represents a permissible circle of confusion of the camera,  $F$  represents a full  $F$  number when the first lens unit is located at the wide-angle end,  $s$  represents sensitivity of the second lens unit to a back focal distance, and  $M_w$  represents a difference between in-focus positions of the second lens unit for an object at the infinite distance and for an object at the minimum distance, when the first lens unit is located at the wide-angle end.

13. The control apparatus according to claim 11, wherein one of the two predetermined focal length positions is a telephoto end.

14. The control apparatus according to claim 11, wherein the memory stores data for determining the reference position based on the difference between the in-focus positions of the second lens unit in accordance with a distance to the object, and the controller sets the reference position with the data.

15. The control apparatus according to claim 11, wherein the in-focus position data is zoom tracking data which represents a moving track of the second lens unit for realizing the same image-forming position at the same object distance regardless of movement of the first lens unit,

the memory stores a plurality of the zoom tracking data for object distances, and

the controller selects one of the plurality of zoom tracking data based on the difference in the in-focus positions of the second lens unit and sets the reference position from the selected zoom tracking data.

16. The control apparatus according to claim 11, wherein the controller performs setting operation of the reference position when power supply thereto is started from the camera or from the outside.

17. The control apparatus according to claim 11, wherein the controller detects the presence or absence of a change in the reference position while an image is taken, and when any change is detected, the controller performs new setting operation of the

reference position.

18. A zoom lens system comprising:

a zoom lens including, in order from an object side, a first lens unit which moves for varying the magnification, a light amount adjusting unit which adjusts a light amount, and a second lens unit which moves for focusing; and

the control apparatus according to claim 1.

19. A zoom lens system comprising:

a zoom lens including, in order from an object side, a first lens unit which moves for varying the magnification, a light amount adjusting unit which adjusts a light amount, and a second lens unit which moves for focusing; and

the control apparatus according to claim 5.

20. A zoom lens system comprising:

a zoom lens including, in order from an object side, a first lens unit which moves for varying the magnification, a light amount adjusting unit which adjusts a light amount, and a second lens unit which moves for focusing; and

the control apparatus according to claim 11.

21. An image-taking system comprising:

the zoom lens system according to claim 18; and

a camera on which the zoom lens system is mounted and which takes an object image formed by the zoom lens.

22. An image-taking system comprising:  
the zoom lens system according to claim 19; and  
a camera on which the zoom lens system is mounted and which  
takes an object image formed by the zoom lens.
23. An image-taking system comprising:  
the zoom lens system according to claim 20; and  
a camera on which the zoom lens system is mounted and which  
takes an object image formed by the zoom lens.